ROUTINE LIFT STATION INSPECTION AND MAINTENANCE

City of Cahokia Heights

St. Clair County, Illinois

January 14, 2022

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TABLE OF CONTENTS

INTRODUCTION

This document has been prepared to address routine lift station inspection and maintenance procedures for the City of Cahokia Heights, St. Clair County, Illinois. The routine lift station inspection and maintenance procedures provide information on the maintenance facilities and equipment needed to inspect and maintain the City's sanitary lift stations, the timely collection and use of relevant information pertaining to the sanitary sewer system, and routine preventative operation and maintenance activities. A list of the City's sanitary lift stations and associated information is included as Attachment A. A copy of the City's Lift Station Inspection Checklist is included as Attachment B. Pump Station Draw Down Testing Procedures are included in Attachment C. And Routine and As-Needed inspection Activities are included as Attachment D.

A. MAINTENANCE FACILITIES AND EQUIPMENT

Adequate maintenance of the sanitary sewer system relies on the availability of equipment and parts. Maintenance facilities are locations where equipment, materials and personnel are dispatched and where operations records are kept. Industry guidance recognizes that properly planned and supported equipment facilities are essential to collection system operations.

1. Equipment

   The City has the following equipment assigned to the operation and maintenance of the sanitary sewer system:

   a. One Tandem Vactor Truck

   b. One Jet Router Truck

   c. One Back Hoe

   d. One Dump Truck

   e. Pick-Up Trucks with Tools

2. Maintenance Facilities

   The Equipment Services Division provides for the maintenance of and coordination for replacement of the City's sanitary sewer system maintenance equipment. The Equipment Services Division performs the following specific functions for the City's sanitary sewer system maintenance equipment:

   a. Perform preventive maintenance and repairs at proper intervals

   b. Evaluate, rehabilitate and modify equipment to include minor accident damage

   c. Oversee outside fueling services

   d. Administer a repair record system

   e. Evaluate equipment replacement and administer the bidding process for purchasing new equipment

   f. Train City personnel on the proper operation of new equipment

B. USE OF TIMELY AND RELEVANT INFORMATION

Timely and relevant information plays a critical role in an effective O&M program. A dynamic O&M program focuses on planning, implementing, reviewing, evaluating and taking appropriate actions in response to available information. The key to these approaches is the ability to get information from the field staff.

The Water and Sewer Department maintains the following databases to ensure the use of timely, relevant information. These include:

1. Wastewater collection system maps
2. Sewer system inspections
3. Manhole inspections
4. Pump station inspections
5. Manhole replacement information
6. Pump station repair information
7. Sewer replacement information
8. Sewer point repair information
9. Sewer televising data
10. Sewer lining information
11. Sanitary sewer overflow data
12. Sanitary sewer system complaint forms

C. ROUTINE PREVENTATIVE OPERATION AND MAINTENANCE ACTIVITIES

A good preventive maintenance program is one of the best ways to keep a system in good working order and prevent service interruptions and system failures which can result in overflows and/or backups. In addition to preventing service interruptions and system failures, a preventive maintenance program can protect the capital investment in the collection system.

Cahokia Heights's Sanitary Sewer Utility's Preventive maintenance activities include:

1. Routinely inspect the collection system and address defects or other problems

2. Investigate complaints and promptly correct faulty conditions

3. Provide maintenance records, an adequate workforce, and appropriate equipment in working order

4. Maintain and update a schedule of planned activities

5. Preventive maintenance activities

ROUTINE INSPECTIONS

Pump stations and temporary or emergency bypass pump station locations are inspected routinely every other day, including weekends, and operation logs are maintained for all pump stations. See Attachment A for a list of pump stations and temporary emergency bypass pump locations. See Attachment B for inspection checklist. The same checklist is used for both permanent and temporary pump station locations. The permanent pump station pumps are serviced and calibrated on an annual basis through "draw-down" tests or equivalence to verify pumping capacities. See Attachment C for draw-down testing procedures. A warning light is provided on some pump station control panels to indicate malfunctioning equipment and/or alarm conditions. Warning lights will be included in any station panel or controls work as part of future planned upgrades and rehab of stations. The City plans to retrofit existing stations with warning lights in the interim starting in August 2022. Warning lights are not included at temporary emergency bypass locations. Service interruptions at these locations are noted during inspections. Portable electrical generators are available in the event power is disrupted at any of the City's pump stations, and temporary pumps and hoses are available to bypass a pump station if necessary.

AS-NEEDED INSPECTIONS

Sewer system inspections, including detailed manhole and pump station inspections, inspections for infiltration and inflow sources, and cleaning of the City's sewer system, are performed on an as needed basis. "As needed" inspections would include activities in response to a backup, failure, or other service interruption, as preparation or verification for repair work, or similar non-routine events. Manhole and Pump Station Inspection Sheets are completed for each inspection and copies are retained in the City of Cahokia Heights Water and Sewer Department. See Attachment D for Routine and as-needed inspection activities and details.

Emergency operating procedures are available for each pump station, and any pump station failures and/or overflows are responded to by Water and Sewer Department personnel. Off hour/emergency notifications are provided through the City Police Department dispatcher.

The Water and Sewer Department also regularly inspects the route of all force mains to assess force main conditions. Air release/vacuum valves are inspected and maintained on an as needed basis.

All pump station and/or force main failures are investigated by the Water and Sewer Department, and any necessary actions are implemented to prevent future failures.

TRACKING AND RECORDKEEPING

The City maintains a record of all sanitary sewer system complaints received by the City and the results of their investigation/resolution. This information provides a useful tool in planning future sewer repairs and/or replacements.

Conditions of infrastructure elements, such as manholes, pump stations, pumps, vaults, etc. are inspected using the checklists included in the Routine Lift Station Inspection and Maintenance Plan, and in the CMOM. Information gathered from these activities is reviewed by department management as reports are generated and turned in, and follow up action is prioritized the following basis:

1. (highest priority) Threat to public safety (sinkholes in streets, cave-ins, etc.)
2. Threat to public health (loss of service, backups, SSO's, etc.)
3. Severity of structural issues (manholes, wetwells, vaults, etc.)

After the inspections, the inspection reports are completed and turned in. During the inspection, employees determine if any minor repairs are required. If so, they are completed and indicated on the inspection report. Daily duties are assigned by the Field Director, daily job sheets are filled out by field employees daily. Any customer calls, complaints, emergencies, or routine jobs are assigned by the Office Clerks via a work order created in Caselle Utility Billing Software. The work orders are closed in the software daily. Any sewer issues, customer complaints or leaks are logged and copies of the work orders for these events are given to the assistant director who keeps a file for future reference. All work orders are filed in the customer file set up for each service address. The work orders records remain in the software for seven years, before being purged from the computer system. Work orders remain in the customer file.

Following the completion of corrective action, records are kept on file of any repairs, including location, type, and detail of the action, such as structures or pumps replaced, logs of CCTV efforts, CIPP lining, excavation and replacement of sewer reaches, and other similar activities. These records would include any plans, specifications, pump data, wiring schematics, construction as-builts, warranties, and other such documentation.

Attachment A

Lift Station Information

Cahokia Heights Sanitary Lift Stations

No.	Lift Station Name	Location	Nearest Intersection	# of Pumps	Pump Manufacturer	Pump Horsepower	Warning Light	Bypass	Previous No.
1	[redacted]			2		40			C-6
2				2		40			C-27
3				1		10	yes		C-3
4				1		10			C-8
5				2		3			C-9
6				1		5			C-10
7				2		3			C-11
8				2		3	yes	yes	C-27
9				1		3	yes	yes	C-14
10				2		3	yes		C-15
11				1		5			C-19
12				1		3.4	yes		C-28
13				2		3		yes	C-4
14				2		3	yes		C-5
15				2		3			C-20
16				2		3	yes		C-12
17				2		3			C-1
18				1		5	yes		C-22
19				1		3			C-7
20				1		3			C-17
21				1		3			C-24
22				2		3			C-21
23				1		5			C-31
24				1		4			C-29
25				1		3	yes		C-16
26				1		3			C-18
27				1		3			C-32
28				1		10	yes		C-30
29				1		3			C-13
30									C-23
31				2	Gorman-Rupp	2.7			W-1
32				2	Gorman-Rupp	7.5		yes	W-2
33				2	KSB	3.4	yes		W-3

[redacted]
Ex. 7f (Water Infra.), Ex. 6 (Personal Privacy)

34	2	Roots	5			W-4
35	2	Roots	3			W-5
36	2	Roots	5			W-6
37	2	Roots	5			W-7
38	2	Roots	2			W-8
39	2	Roots	1.5			W-9
40	2	Roots	7.5		yes	W-10
41	2	Roots	7.5			W-11
42	2	Roots	3		yes	W-12
43	2	Gorman-Rupp	3		yes	W-14
44	2	Flygt	7.5	yes		W-15
45	2	Barnes	4.5			W-16
46	2	Flygt	3	yes		W-17
47	2	KSB	3.4			W-18
48	2	Grundfos	5.5	yes		W-19
49	2	Gorman-Rupp	3			W-20
50	2	Gorman-Rupp	3		yes	W-21
51	2	Gorman-Rupp	5		yes	W-22
52	2	Fairbanks Morse	5		yes	W-23
53	2	Barnes	1.5		yes	W-24
54	2	Crown	7.5		yes	W-26
55	2	Gorman-Rupp	3			W-27
56						A-5
57						A-4
58						A-6
59						A-7
60						A-8
61						A-2
62						A-3
63						---
64				yes		A-1
65				yes		A-10
66						A-9
67						W-25
68				yes		C-25
69						C-26

City of Cahokia Heights List of Sewer Line Bypasses as of June 8, 2022

	Address	at Pump Sta.
1	Ex. 7f (Water Infra.), Ex. 6 (Personal Privacy)	y
2		
3		y
4		
5		y
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		y
18		y
19		y
20		

Attachment B

Lift Station Inspection Checklist

LIFT STATION INSPECTION CHECKLIST
CITY OF CAHOKIA HEIGHTS, ILLINOIS

Lift Station Name: _____ Inspection Date: _____

Lift Station Location: _____ Inspected By: _____

Number of Pumps: _____

Pump Manufacturer: _____

Pump Horsepower: _____

WETWELL:

- ☐ Inspect interior and exterior surfaces
- ☐ Check for proper access hatch operation
- ☐ Verify float system operating condition
- ☐ Inspect pump guide rails

PUMPS:

- ☐ Pull and reset pump (if needed)
- ☐ Check for ease of removal and proper sealing at disconnect flange
- ☐ Check pump chords for obstructions
- ☐ Check pump for normal operation
- ☐ Check for unusual noises and/or vibration

VALVE VAULT:

- ☐ Check sump pump operation
- ☐ Verify pressure gauges are in place (if applicable)
- ☐ Check for proper access hatch operation

CONTROL PANEL:

- ☐ Verify that wiring schematic is on file in Sewer Department Office
- ☐ Inspect enclosure for damage
- ☐ Inspect wiring
- ☐ Perform operational test
- ☐ Verify that electrical conduits are sealed
- ☐ Verify high water warning light operation

COMMENTS: _____

Attachment C

Lift Station Draw Down Testing Procedures

There are two variations to determine the output of a pump in a lift station wet well. Criteria which are necessary for these basic steps to be accurate include...

- the shape of the wet well structure must be such that the area of the water surface is constant, i.e., the station walls are symmetrical and parallel. This describes 99% of the wet wells being most wet wells are either cylinders or rectangular boxes.
- the depth of all of the water surface measurements must be taken below the invert of the lowest incoming line and above the snore level. If the level begins to fill the incoming line and/or manholes upstream, the test is indeterminate. The snore level occurs when the water level is lowered to the pump intake, thereby allowing air into the pump volute.
- there is no momentary surge of incoming flow from tributary pump station(s) that does not remain "constant" over the full time period of the test period.

Equipment Required

- Stop-Watch or Timer (seconds)
- Depth Measurement Device
    - Tape Measure or other suitable measuring device capable of reaching the water surface at the lowest level.
    - Buoyant float securely attached to a length of rope of sufficient length to reach the water surface at the lowest level.

Fixed Time Method

1. Turn the HAND-OFF-AUTO (HOA) for both pumps to OFF
2. Determine the depth of water in the wet well.
3. Start the timer.
4. After a fixed time frame, for example 2 minutes, measure the rise of the water surface in the wet well.
5. Calculate the volume of water in gallons received during the time span in Step 4.
6. Divide the volume obtained in Step 5 by the selected time frame in Step 4. This is the rate of inflow during the test.
7. Reset the timer.
8. Determine the current level of water in the well.
9. Simultaneously, start the subject pump in HAND and start the timer.
10. Allow the subject pump to run for a fixed time frame, 3 minutes for example.
11. After the fixed time frame has elapsed, simultaneously stop the subject pump and measure the depth of the water in the well.
12. Calculate the volume of the wet well from the elevation when the timer was started in Step 8 and when the timer was stopped in Step 10.
13. Divide the volume contained in the change in elevation from Step 12 by the selected timeframe from Step 10.
14. Find the pump flow rate by adding the gallons per minute (gpm) rates from Step 6 and Step 13.

Fixed Volume Method

1. Turn the HAND-OFF-AUTO (HOA) for both pumps to OFF
2. Determine the depth of water in the wet well.
3. Start the timer.
4. After a fixed change in elevation, for example 2 feet, note the elapsed time in minutes.
5. Divide the volume in gallons of the fixed change in elevation by the elapsed time in minutes from Step 4. This is the rate of inflow during the test period.
6. Reset the timer.
7. Measure the depth of water in the wet well

8. Simultaneously start the subject pump in HAND and the timer.
9. Allow the pump to discharge until the fixed change in elevation is reached, for example 3 feet. Record the elapsed time, in minutes
10. Calculate the volume in gallons of the wet well between the elevation when the timer was started in Step 8 and when the fixed change in elevation was reached in Step 9.
11. Divide the volume in gallons contained in the change in elevation in Step 10 by the recorded time in minutes from Step 9.
12. Find the pump flow rate by adding the gallons per minute (gpm) rates from Step 5 and Step 11.

NOTES:

- Depending upon the rate of inflow during the test period, it may be necessary operate a pump in HAND to pump the water level down to "reset" the elevations of the test to be within the acceptable range, below the lowest invert elevation.
- Time frames and elevation ranges may need to be adjusted from the given examples to accommodate incoming flow vs. pumping rate to assure the water surface level is always within the range between the snore elevation and the lowest incoming line invert.
- The longer the testing time frames and/or the greater the volumes between start/stop cycles, the more accurate the results.

Attachment D

Routine and As-Needed Inspection Activities

ROUTINE AND AS-NEEEDED INSPECTION ACTIVITIES FOR PUMP STATIONS
Weekly (Every other Day) : • Visually/Audibly inspect the lift station • Record pump hours for each pump if applicable • Wash & Vac down wet well – as needed • Check for sand and sludge accumulation • Check for indication of high water levels • Inspect lights and alarm systems • Complete inspection form
Monthly: • Visually inspect each pump for proper pumping (run each pump by manual control, watch level rise and fall) • Pump down wet well to lowest point, and make visual inspection • Check wet well floats • Exercise suction and discharge valves • Complete inspection form
Every Six months (Or as needed): • Remove excessive grit & grease with VAC Truck • Inspect pumps (visually check pumps and piping for defects, record amperage and readings for each pump) • Clean and inspect Floats

Routinely:

- Inspect electrical equipment (burnt wiring/connections/components, corrosion or moisture)
- Wet wells pumped and cleaned
- Submersible level sensors cleaned if applicable
- Inspect and clean valves
- Pull pumps and perform pump inspection (check impeller wear; water in oil/coolant; water/oil/coolant in housing)

As needed:

- Respond to all lift station alarms
- Keep surrounding area of list station clean
- Inspect locations and structures/equipment in response to backup, failure, or other service interruption, as preparation or verification for repair work